Turning To The Masters

Motion Capturing Cartoons

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Stanford Graphics Laboratory

The Motion Capture Soup

- Thrive for Realism
- Motion Capture is Easily Availal
- Many Re-Targeting / Editing Techniques based on Mocap

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Expressive Animation

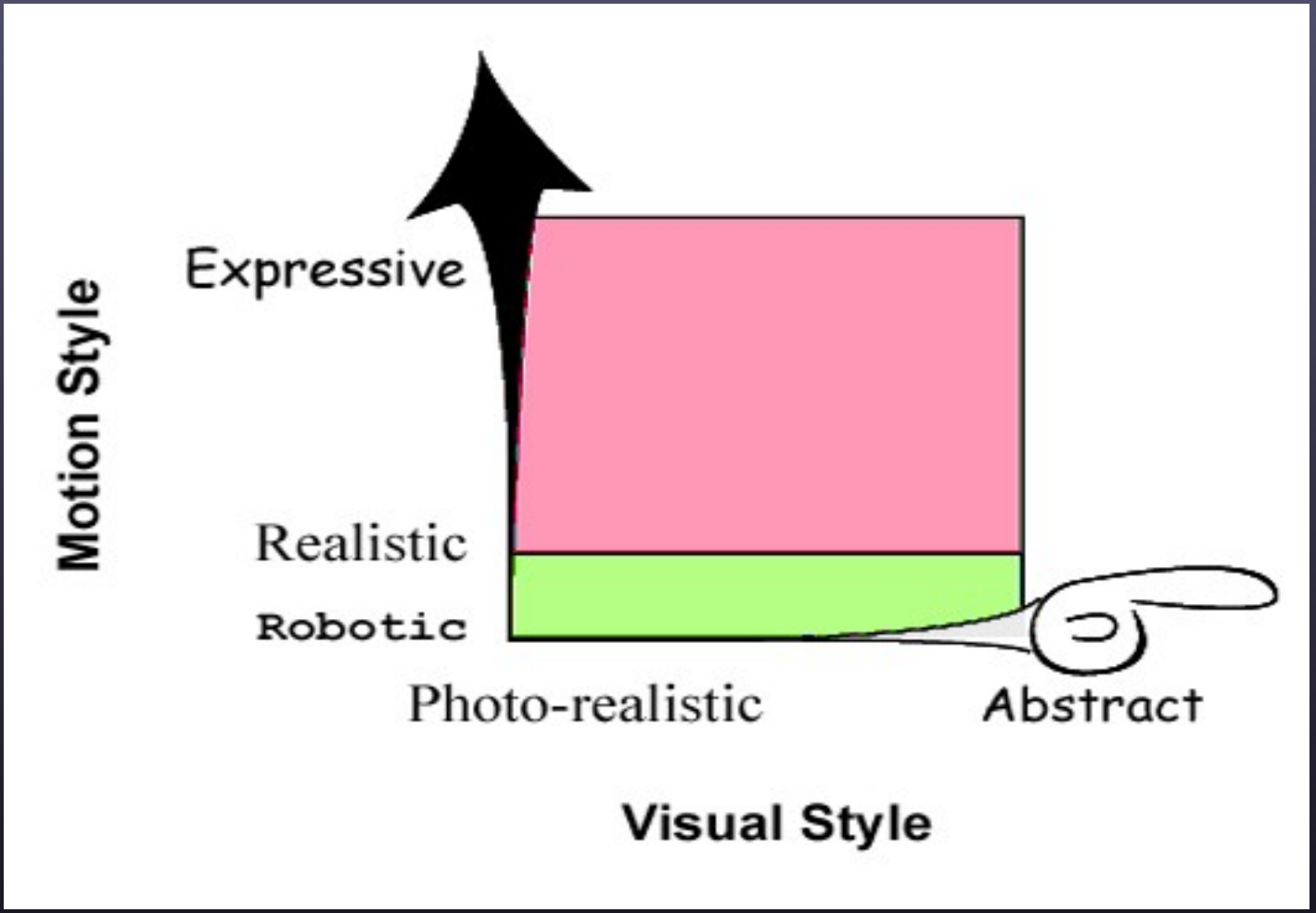
The goal is not always to be realistic.

Sometimes the goal is:

- ✓ **to create magic,**
- ✓ **to tell great stories,**
- ✓ **to create dynamic characters,**
- ✓ **to find new ways to bring life to the screen.**

Sometimes realism isn’t enough.

Realm of Cartoon Capture



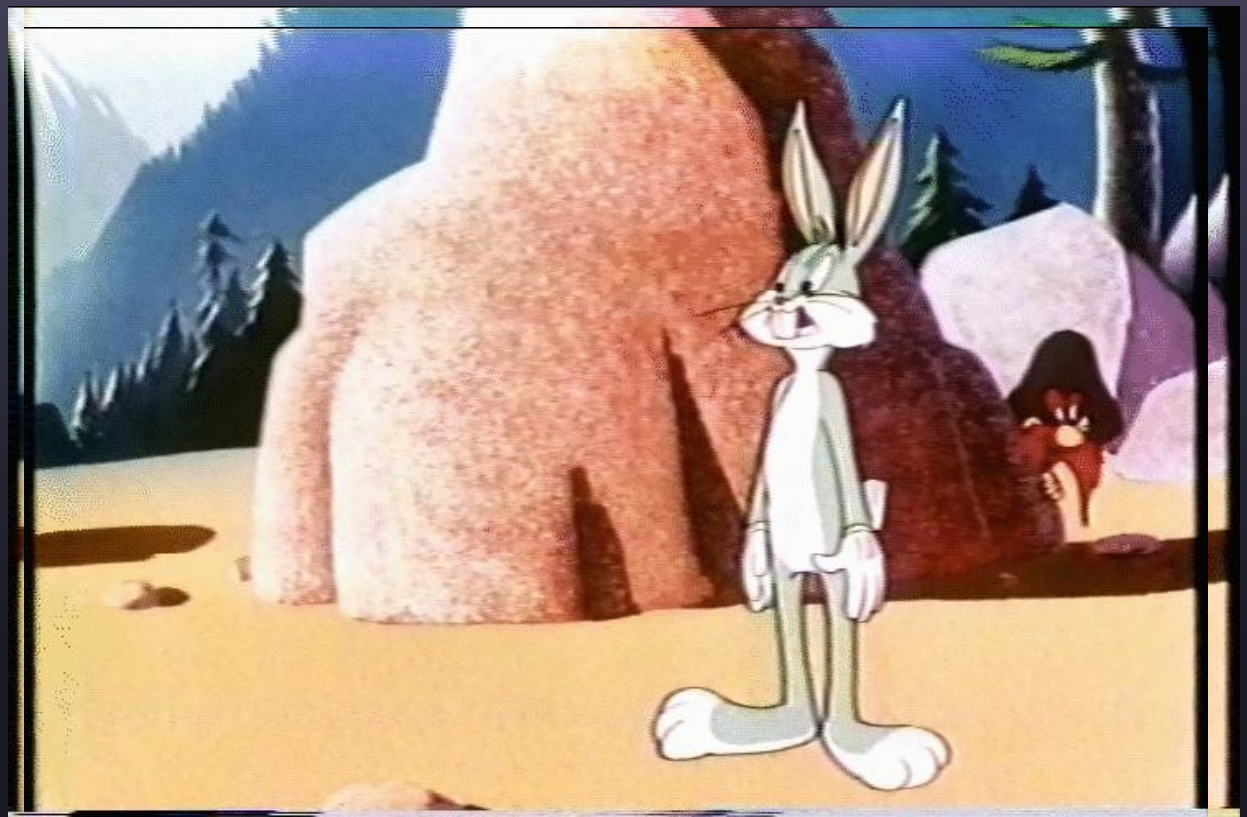
New ***Front-End*** to existing ***Pipe-line***

Focus of this Paper:

New Cartoon Front-End

Cartoon Capture Challenges

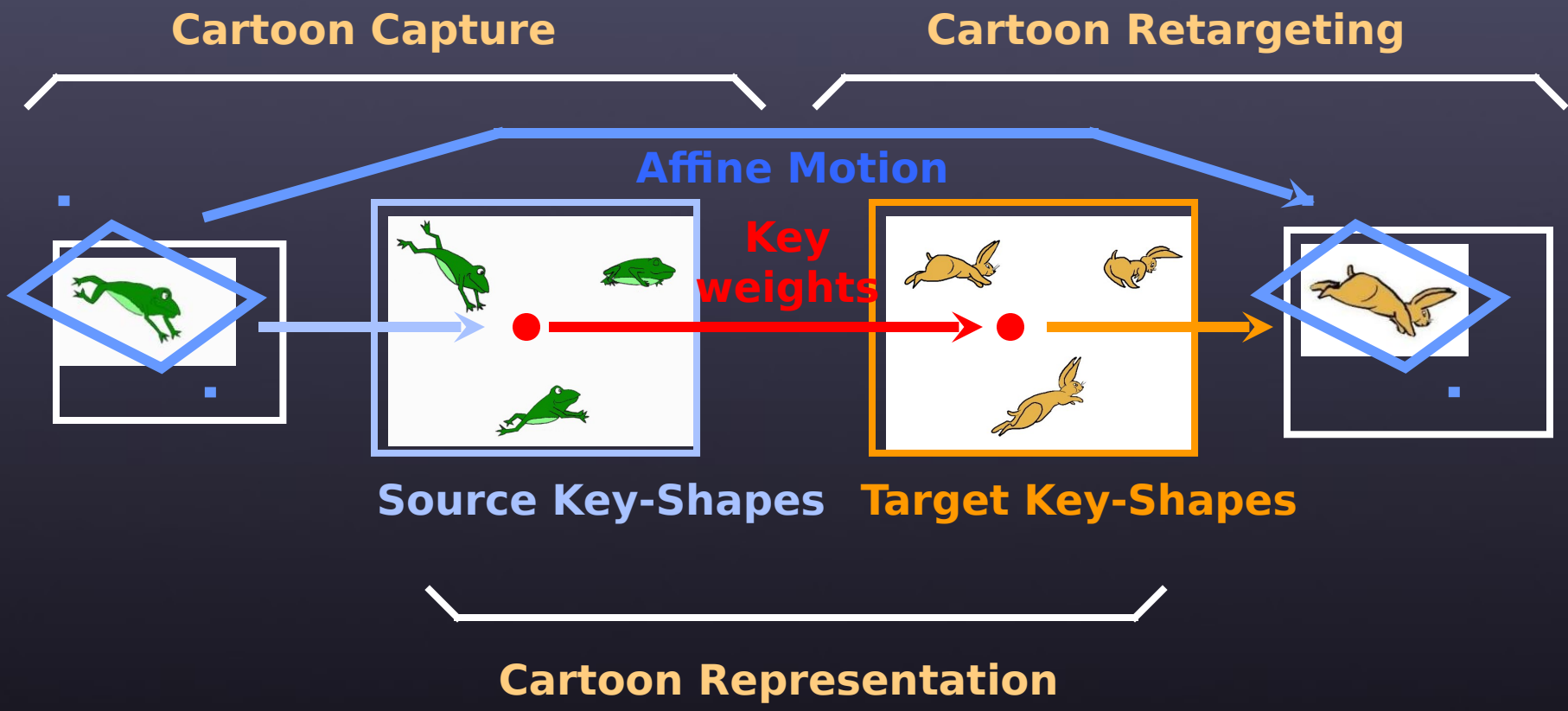
1. Can’t put optical markers on a cartoon
2. Low frame rate (24-30 fps)
   + animating on 2’s
   = large changes between frames
3. Often difficult to identify joint locations/large deformat



Re-Targeting Challenges

1. Key shape based, not skeleton based
2. Need to translate from 2D to 3D
3. Map between characters with different features and bod

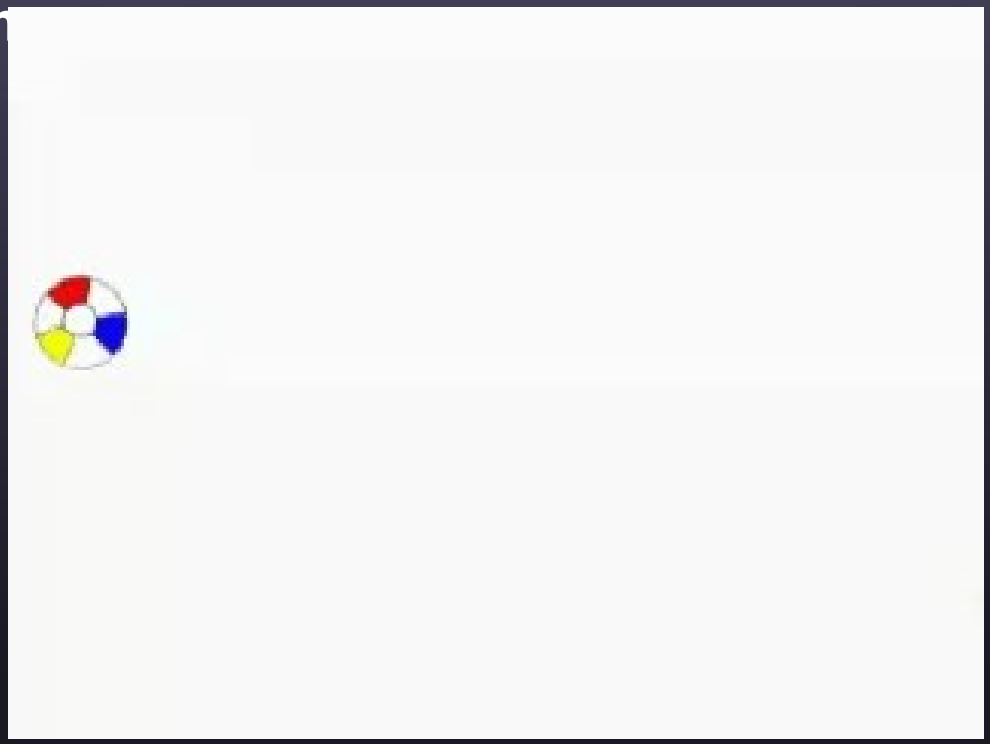
Overview


Cartoon Capture
Cartoon Retargeting
Affine Motion
Key weights
Source Key-Shapes
Target Key-Shapes
Cartoon Representation

Representing Cartoon Motions

Primary Coarse Motion:

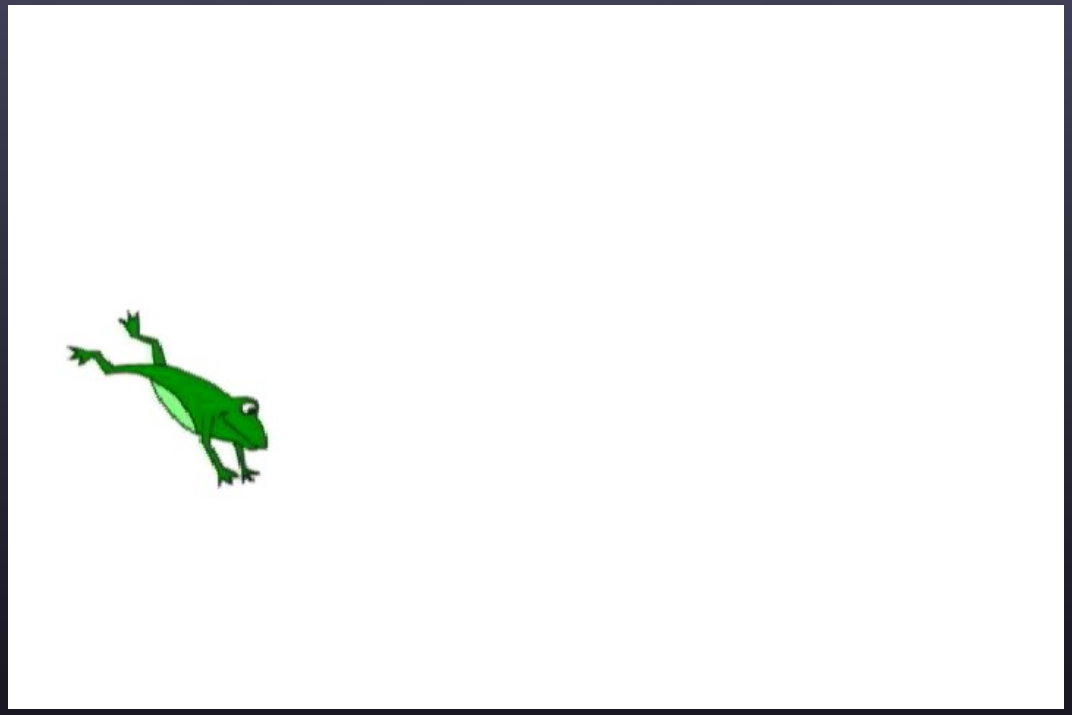
- **Squash & Stretch**
- **Arcs of action**
- **Timing and Spacin**



Representing Cartoon Motions

Non Affine Motion:

- **Key-Shape Deformations**



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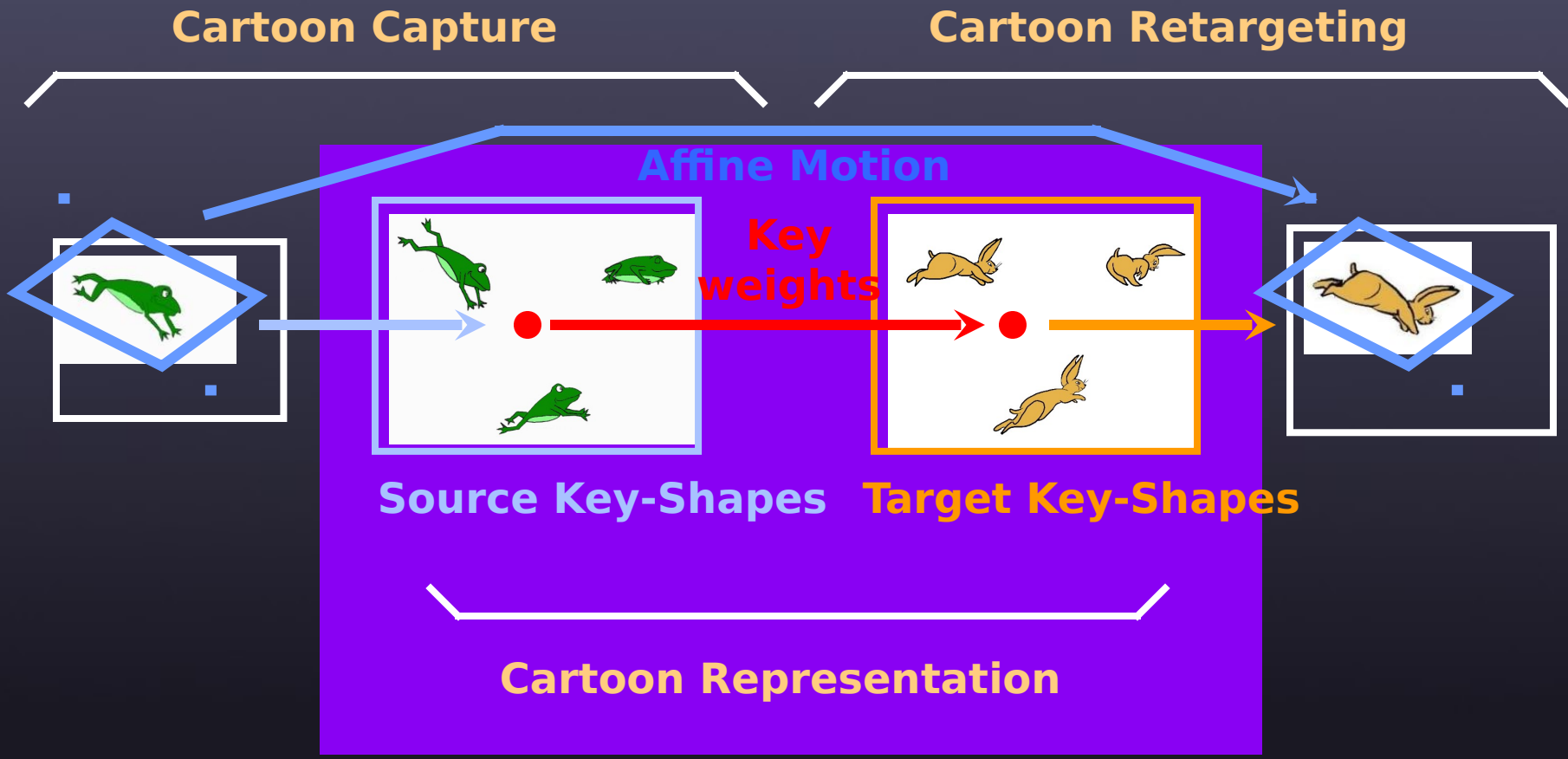
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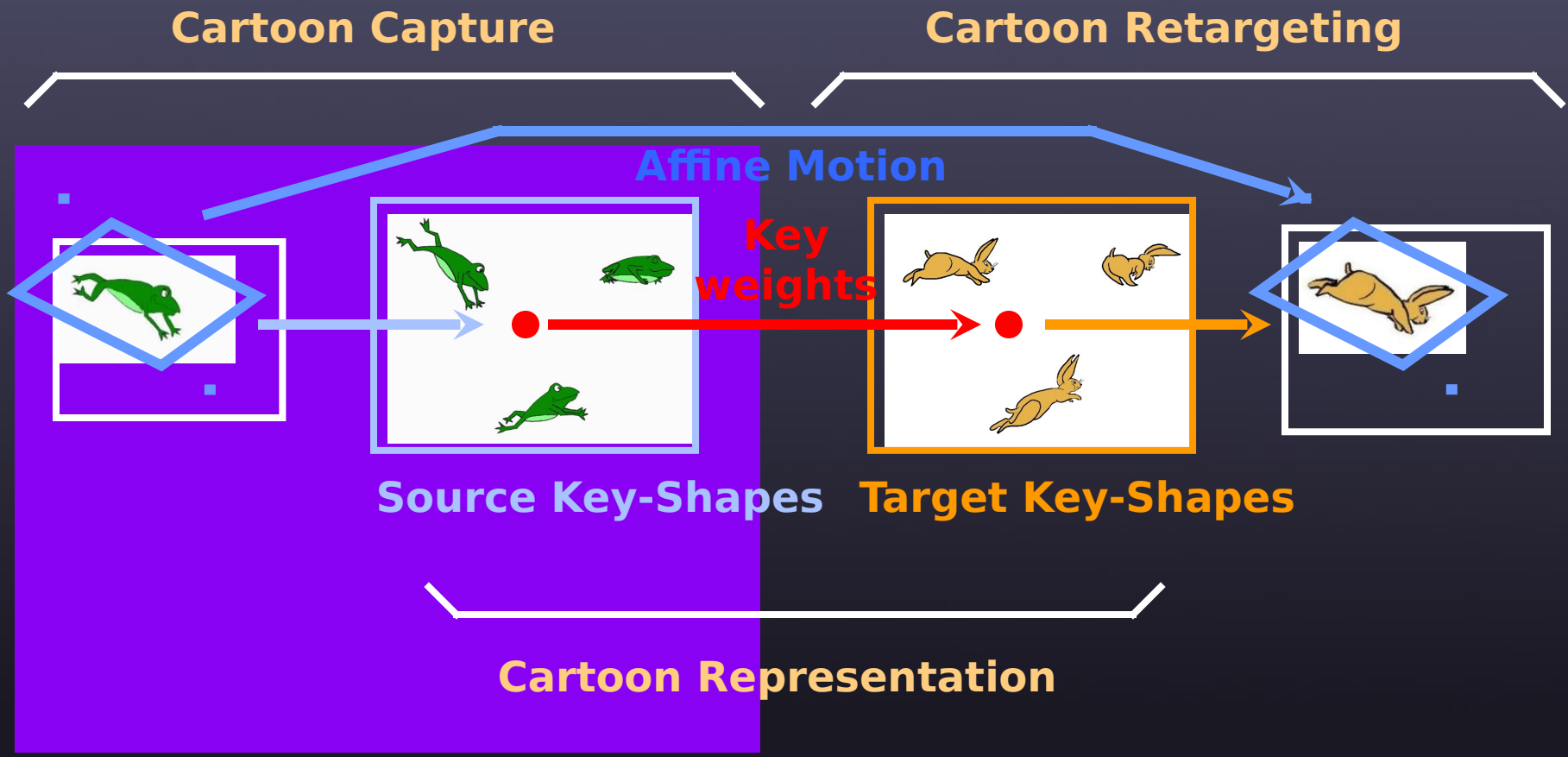
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Capture Cartoon Motions

Capture = Reverse Engineer Animation

1) Choose ***Key-Shapes***
2) Build a ***Cartoon Model***
3) Use ***Least-Squares*** to find Affine and PCA-Deform

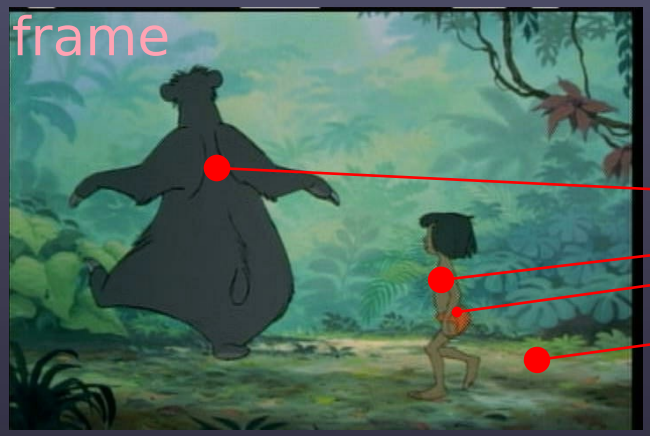
Capture Cartoon Motions

Example

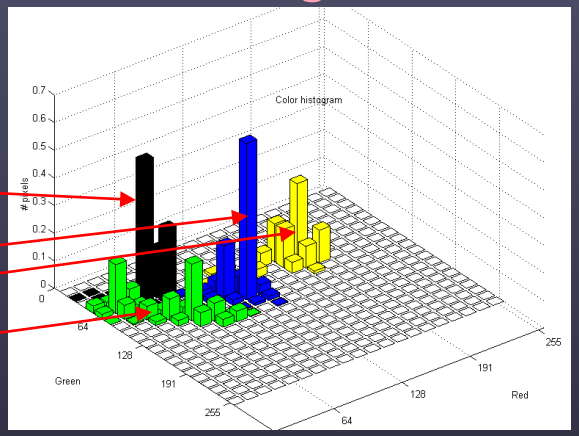
Build Cartoon Model

Segment sub-parts using Color Clustering

Reference frame



Color histogram



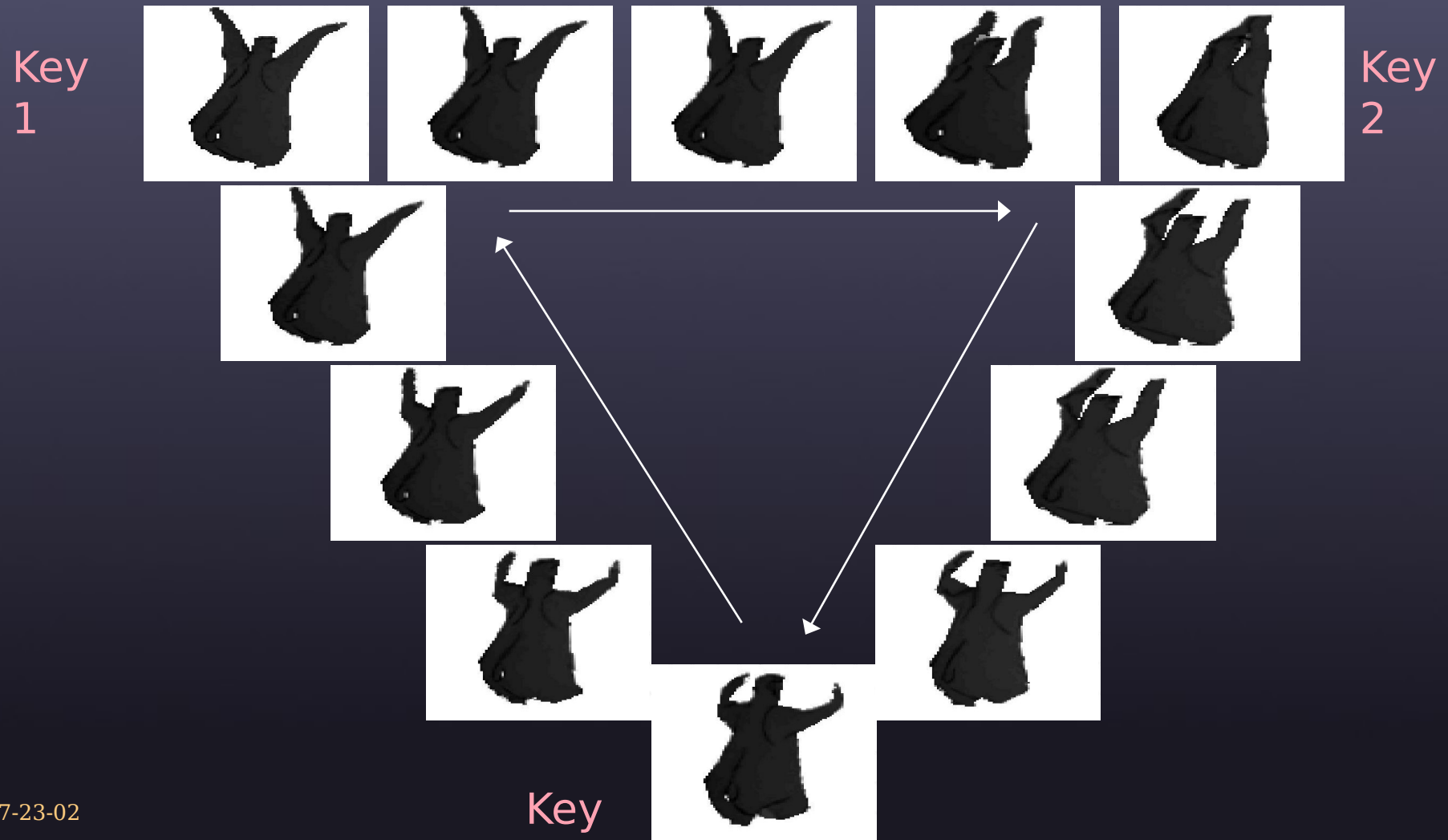
Segmentation results using posterior

Build Cartoon Model

Label ***Key-Shapes***

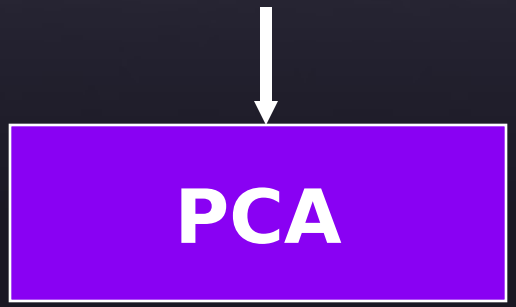
Build Cartoon Model

Create In-between Database:



Build Cartoon Model

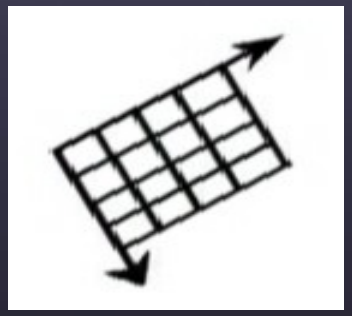
Train Compact PCA model:



Capture Cartoon Motions

3) Use Least-Squares to find Affine and PCA Deformat

=



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PCA

Input Video

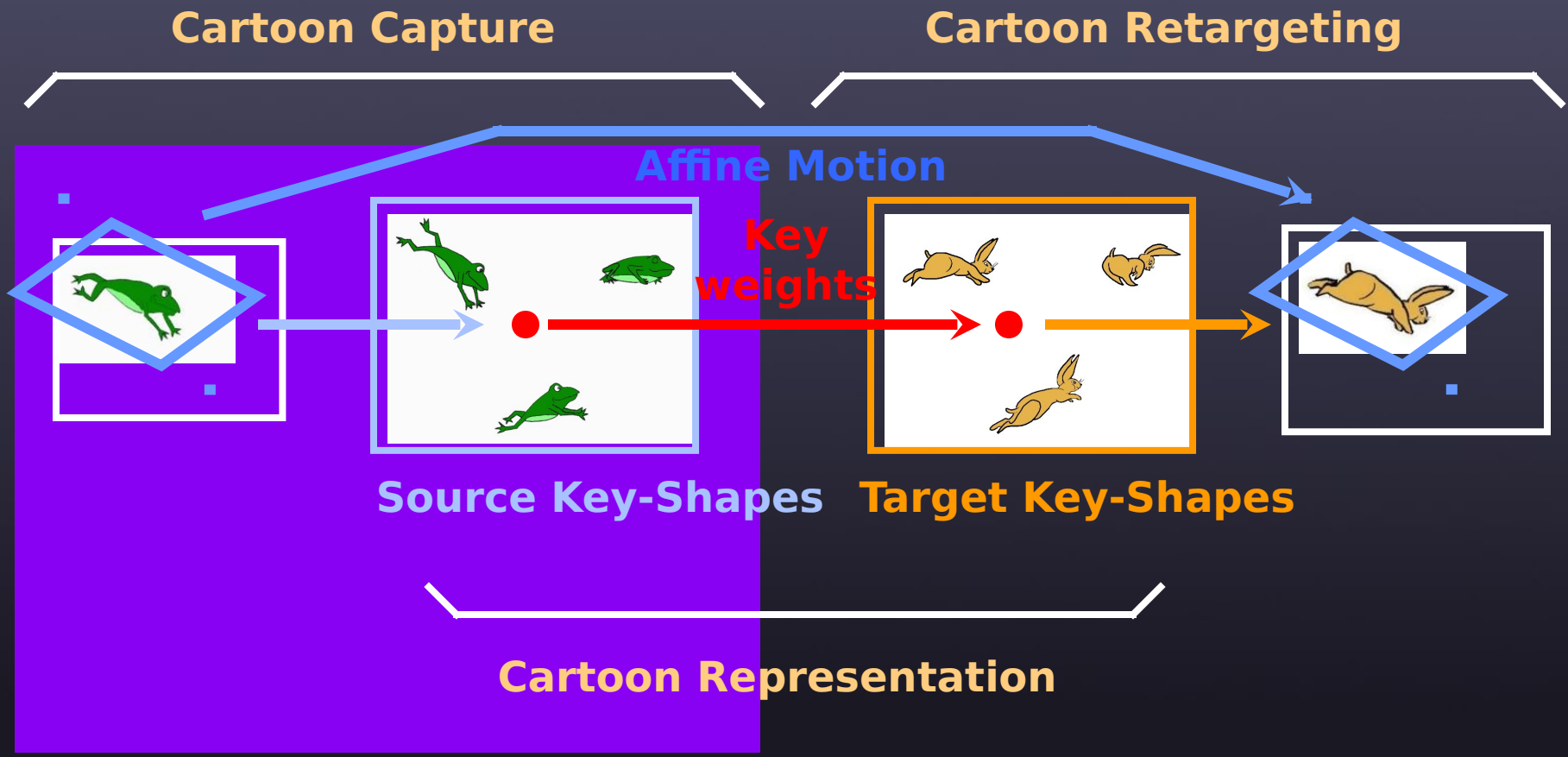
Affine Warp ?

PCA parameters

Capture Cartoon Motions

Use Least-Squares to find Affine and PCA Deformation

Overview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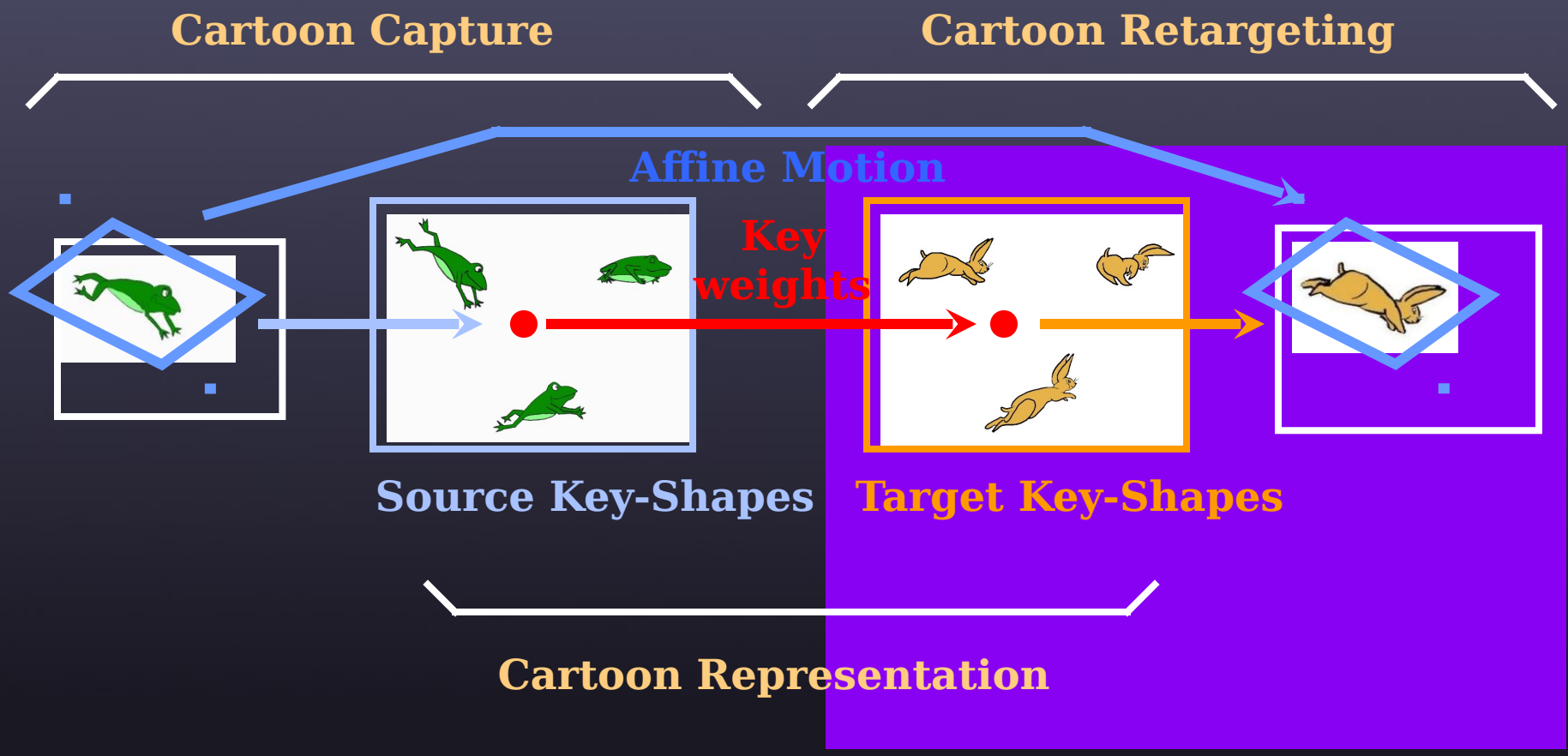
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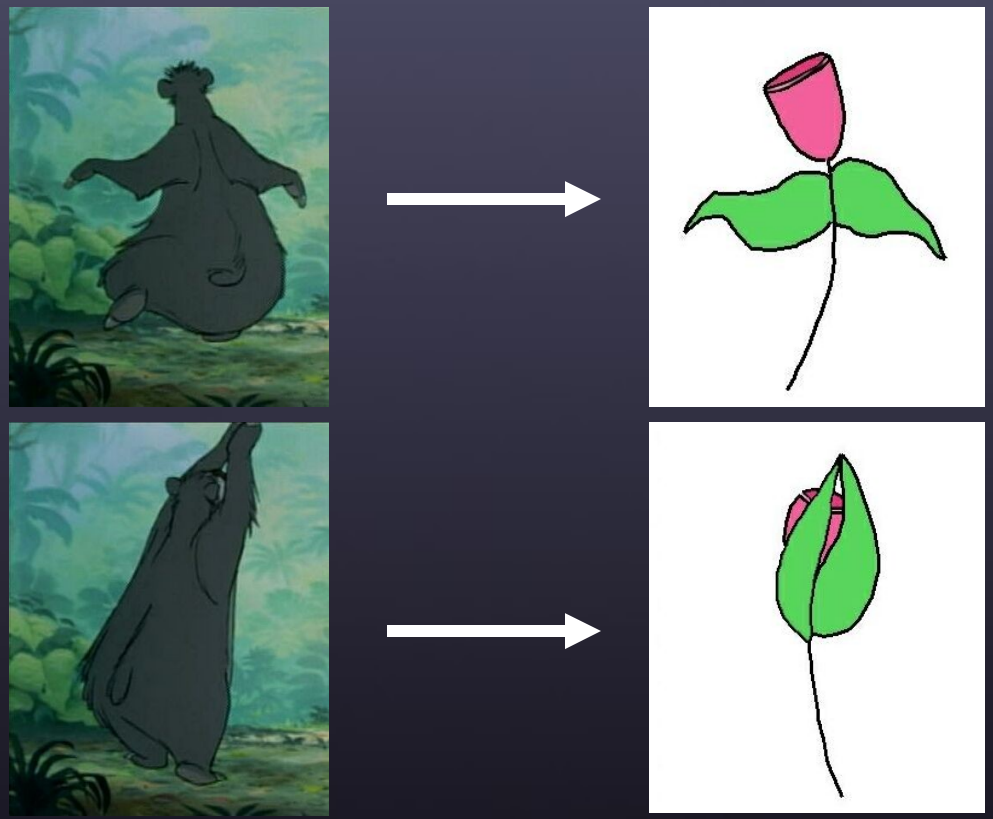
Retarget Cartoon Motions

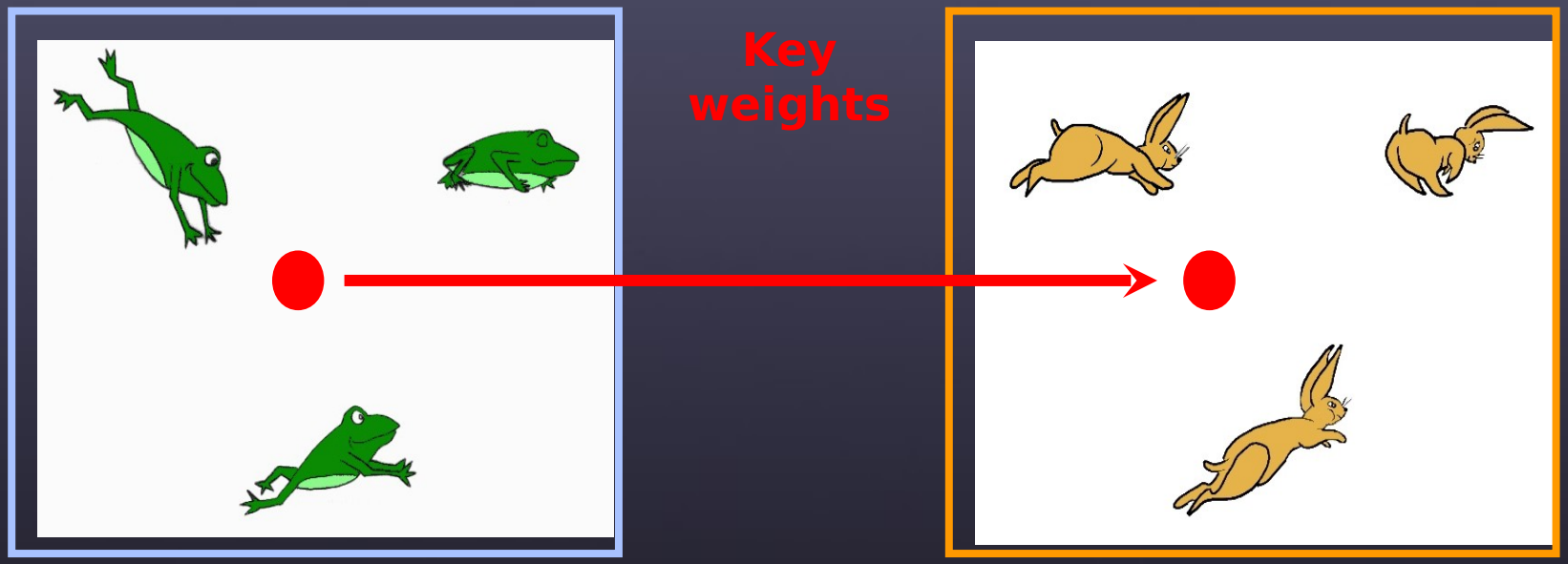
Design new Key-shapes



Retarget Cartoon Motions

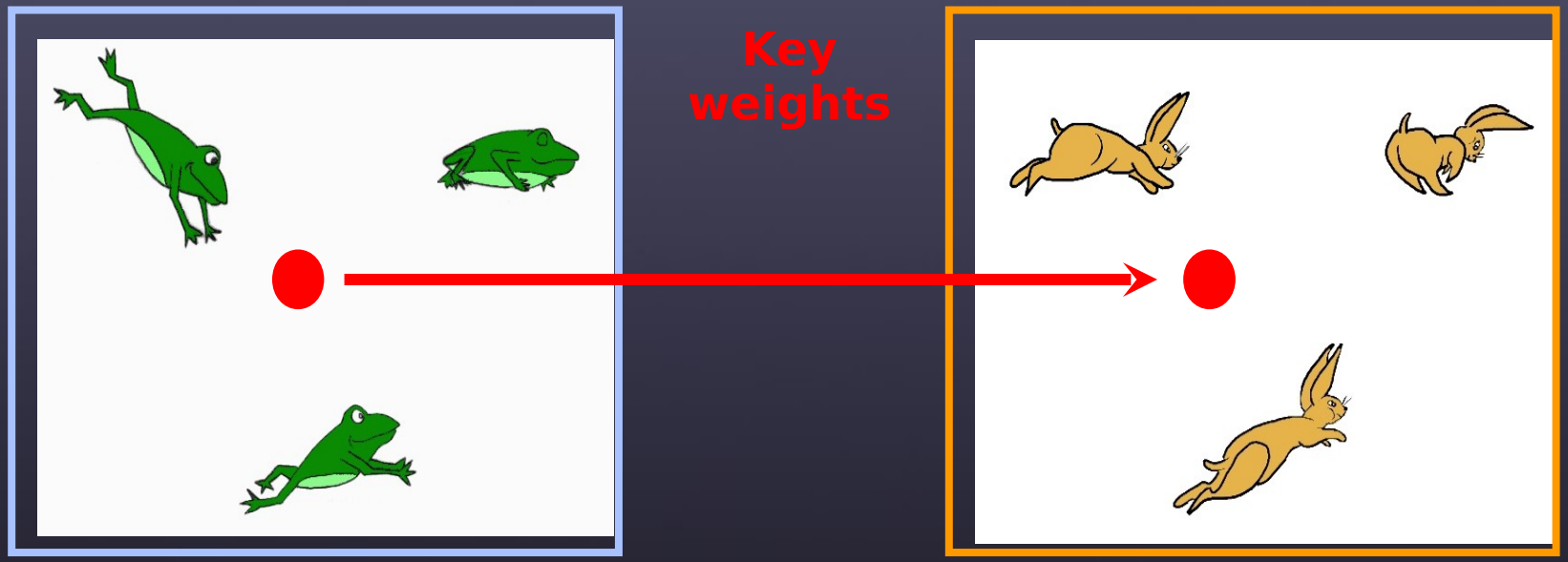
Different Medium

Retarget Cartoon Motions



Retarget Cartoon Motions

Key-Weight Constraints:



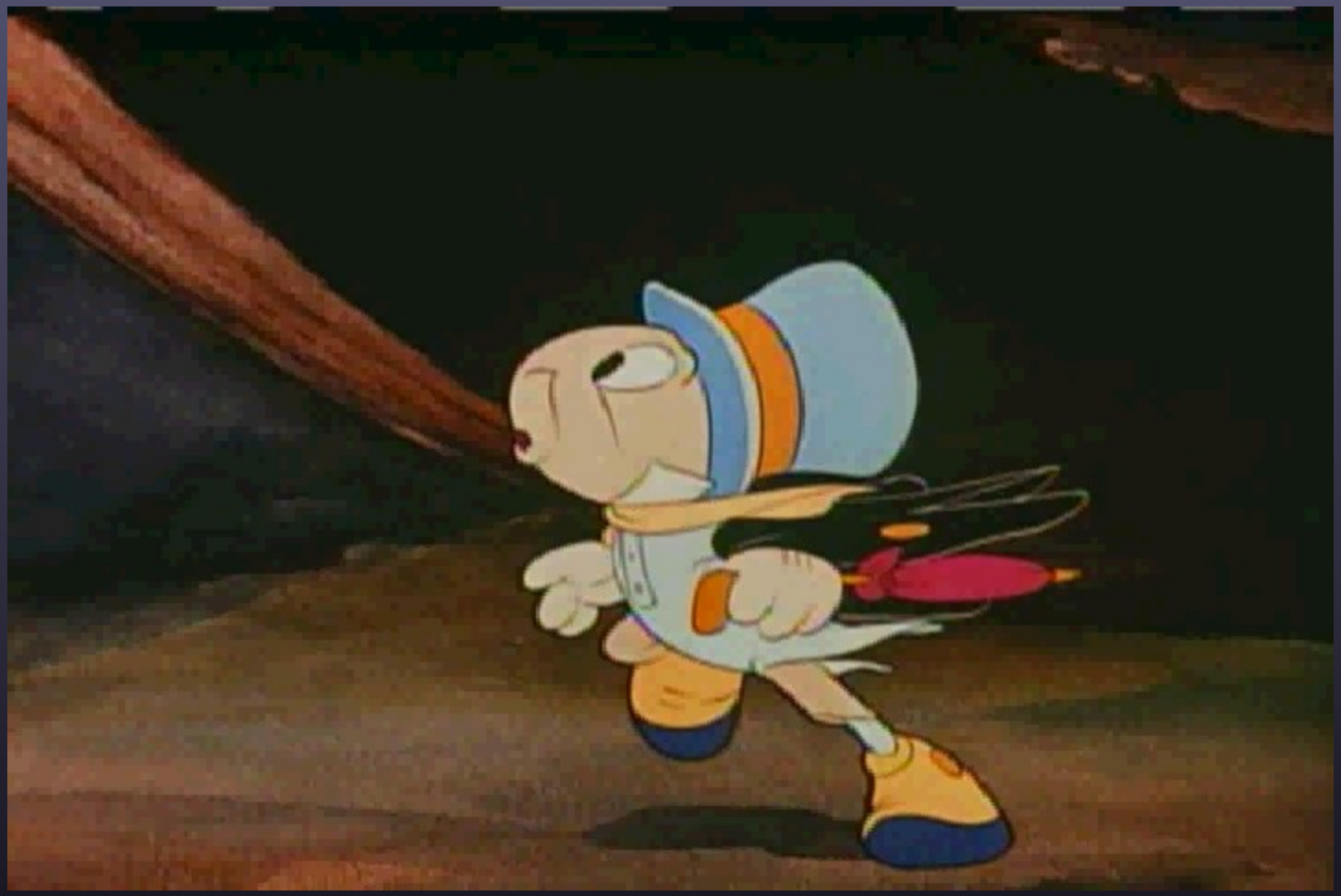
Retarget Cartoon Motions

Key-Weight Constraints:

1) No Negative Weights
2) Weights Sum to 1
3) Only a few weight are non-zero

Retarget Cartoon Motions

Examples



Examples

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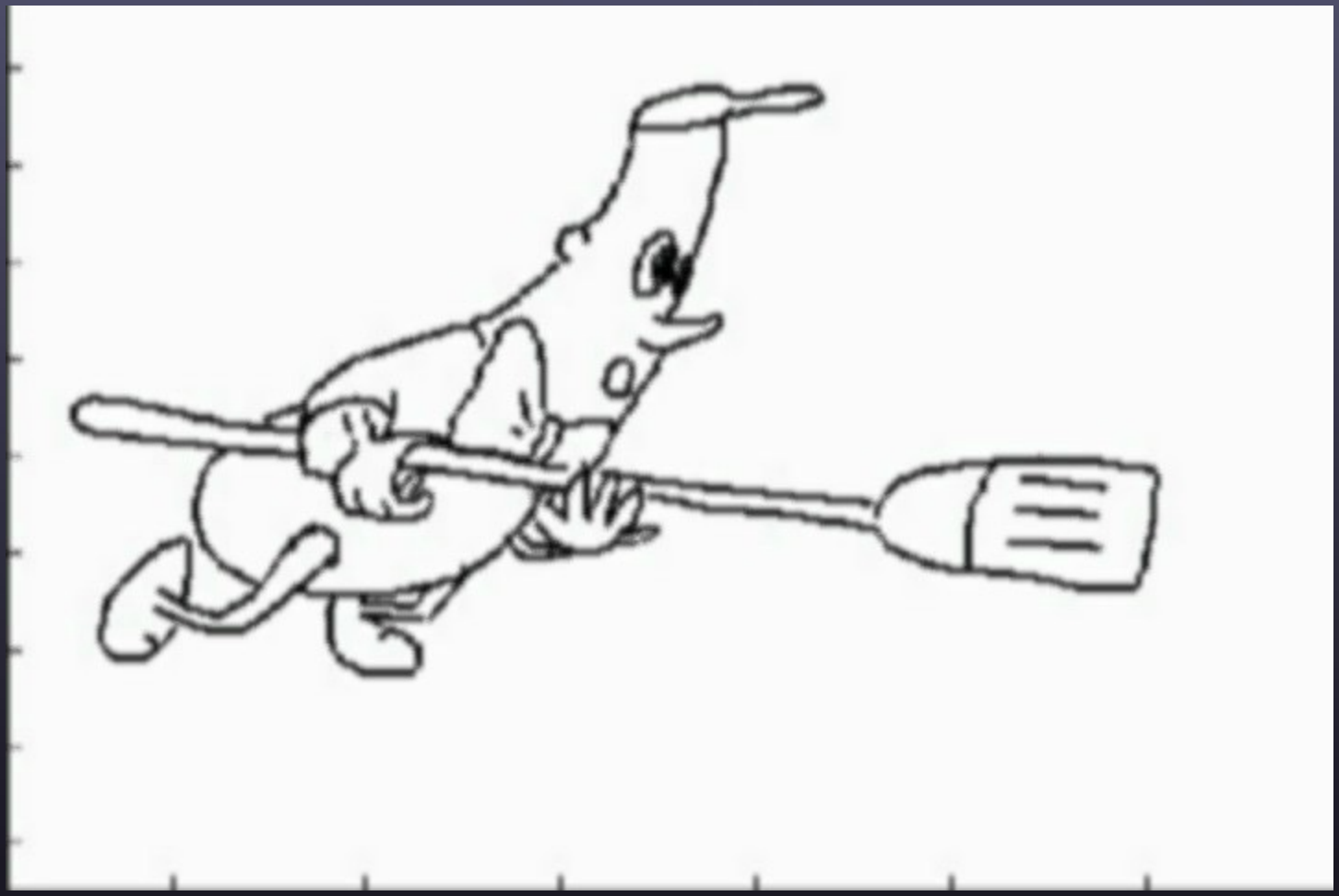

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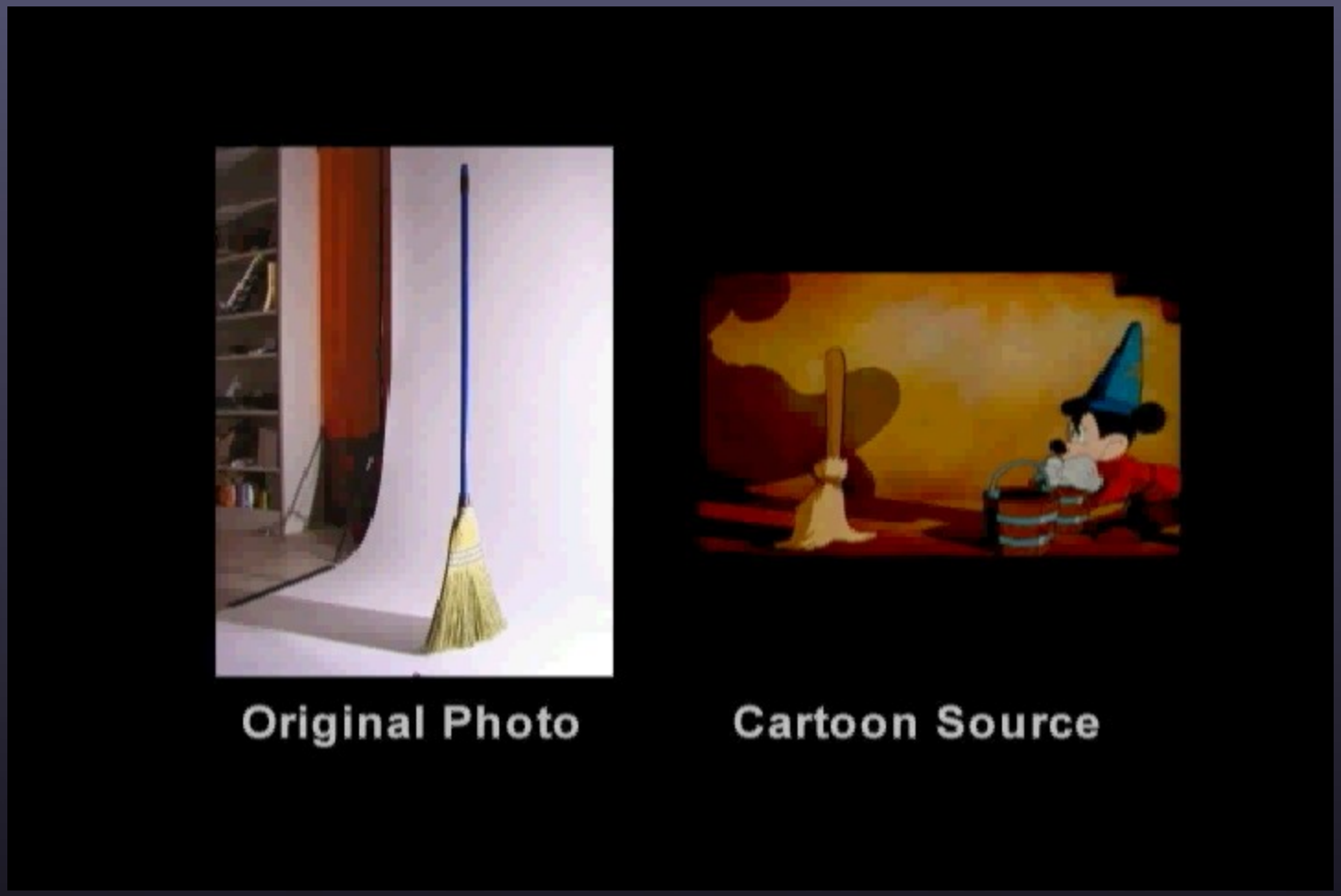

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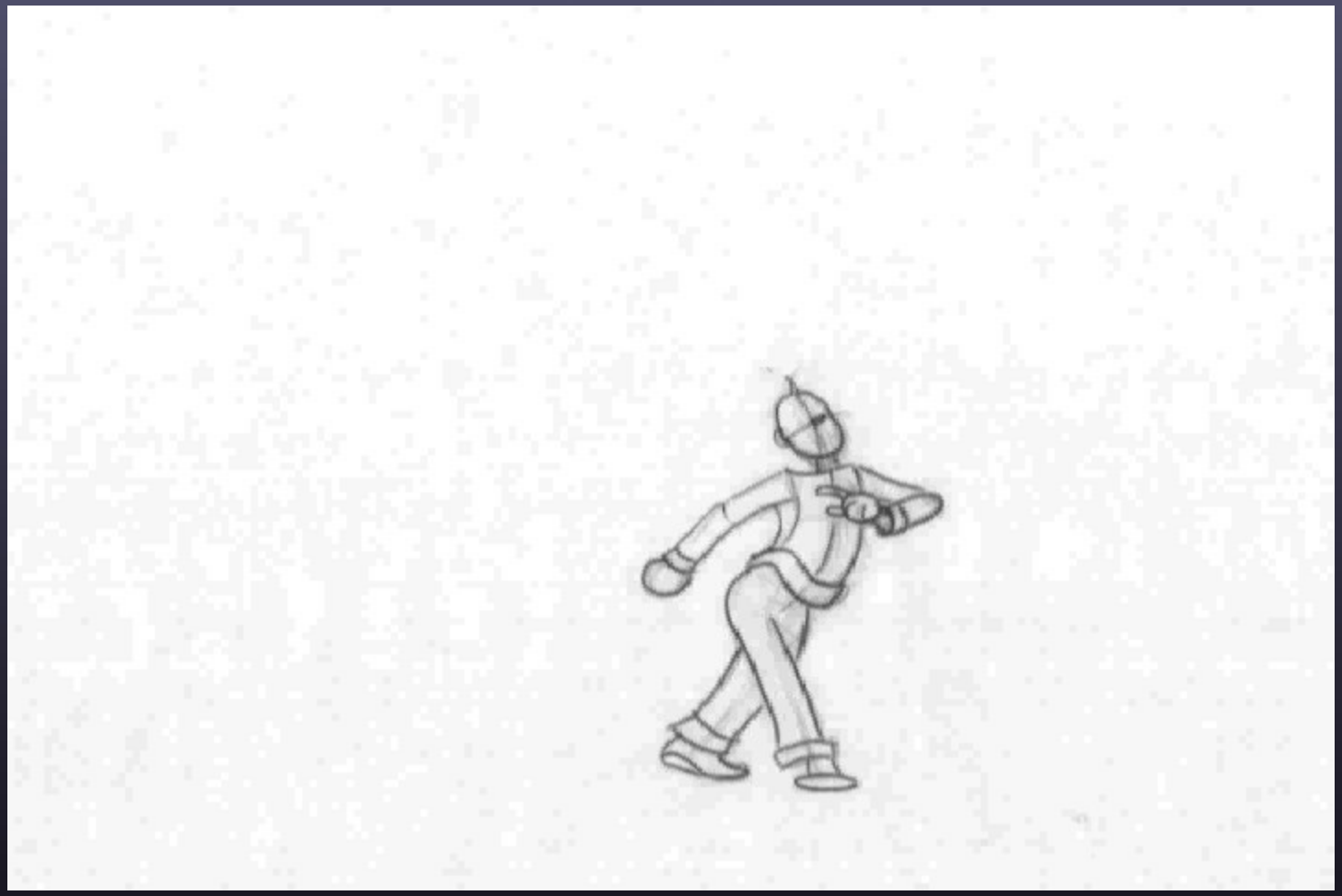

Examples

Conclusions

- Bridges gap between mo-cap and animati
- Useful when realism is not a goal.
- Effort to add more ingredients to the sou

Future Work

- Want to reduce number of key-shapes nee
- More accuracy with less information a goa
- Smoothing or constraints to reduce jitter
- Derive 3D animations from simple pencil t
- Non-realistic animal animations
- Motion editing

http://Movement.stanford.edu

Work of the Stanford Movement group

Shameless Plug:
See talk by Kathy Pullen on Motion Textu
Today at 5:05 PM (last paper talk of the d
This room – C1 & C2

Acknowledgements

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Motion Study students

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Electronic Arts
Microsoft Research
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